

REMARKS/ARGUMENTS

Reconsideration and allowance of this application, as amended, are respectfully requested. The written description and claim 8 have been amended. New claim 9 has been added. Claims 1-9 are now pending in the application. The rejections are respectfully submitted to be obviated in view of the amendments and remarks presented herein.

The written description has been amended on page 3, lines 3-5 to correct a typographical error. No new matter has been added. Claim 8 has been amended and claim 9 has been added to more clearly define the invention.

35 U.S.C. § 102(e) – Merrill

Claim 8 stands rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Merrill (U.S. Patent No. 5,892,541) (hereinafter “Merrill”). Reconsideration is respectfully requested.

The present invention relates to an active pixel sensor with mixed analog and digital signal integration. Claim 8 recites:

A method of acquiring an image, comprising: forming a CMOS image sensor on a semiconductor substrate; using said CMOS image sensor to image a scene and to produce image output information; sampling each pixel of said CMOS image sensor at a time period less than a desired integration time for each frame of the image using an analog signal processor including column analog double sampling circuitry and a preamplifier with adjustable gain; converting each sampled pixel to digital; and storing the digitally-converted pixels in a digital memory, and using said digital memory to digitally integrate said digital pixels for the desired integration time, to thereby output a digitally integrated image. (Emphasis added).

The Merrill reference relates to an imaging system in which "[e]ach time a cell is read, the number of photons collected by the cell is saved and the cell is reset if the cell would normally saturate by the end of the integration period." Abstract.

The Merrill reference does not teach or suggest "sampling each pixel of said CMOS image sensor at a time period less than a desired integration time for each frame of the image using an analog signal processor including column analog double sampling circuitry and a preamplifier with adjustable gain." Accordingly, the rejection of claim 8 under 35 U.S.C. § 102(e) over Merrill is overcome.

35 U.S.C. § 103(a)Merrill in view of Fossum et al.

Claims 1, 2 and 4-7 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Merrill in view of Fossum et al. (U.S. Patent No. 5,665,959) (hereinafter "Fossum"). Reconsideration is respectfully requested.

It is acknowledged in the Office Action that Merrill does not teach or suggest "a CMOS image sensor, formed on said semiconductor substrate... [and] a digital memory, also formed on said semiconductor substrate." Accordingly, it is proposed in the Office Action to combine the disclosure of Merrill with that of Fossum. In order to combine references under 35 U.S.C. § 103(a), however, there must be a teaching or suggestion in the prior art to support the combination. The Office Action purports to find this teaching or suggestion in the statement in Fossum that "[t]he advantage of the monolithic architecture is to be found not only in improved performance, but also in the ease of fabrication." Column 9, lines 63-65. The performance characteristics pertinent to the Fossum reference, however, are completely different from those pertinent to Merrill. Fossum relates to a system able to "discriminate detection of an [1] incident photon by the photoelectron (e^-) generated in the detector diode at the input of the first cascode amplifier in order to count incident electrons individually in a digital counter connected to the output of the second cascode amplifier. Resetting the input capacitance and initiating self-biasing of the amplifiers occurs every clock cycle of the integrating period to enable ultralow light level image detection by the array of photovoltaic detector diodes under such ultralow light level conditions that the photon flux will statistically provide only a single photon at a time incident on any one detector diode during any clock cycle, " (emphasis

added). Abstract.

This is completely different from the performance characteristics pertinent to the Merrill disclosure. Merrill relates to "an imaging system and method for increasing the dynamic range of an array of active pixel sensor cells," (column 1, lines 9-11), where "dynamic range is defined by the maximum number of photon that a cell 10 can collect during an integration of period without saturating," (column 2, lines 11-13). Accordingly, Merrill relates to a system adapted to "allow each cell in the array to be individually reset so that cells which are exposed to light sources which would normally saturate a cell can be read and reset multiple times during each integration period," (emphasis added). Column 3, lines 36-40. The system of Merrill is adapted to be used "in a video context with respect to cell C1 of Fig. 2, which is exposed to bright light, cell C2 of Fig. 2, which is exposed to intermediate light and cell C3 of Fig. 2, which is exposed to low light," (emphasis added). Column 7, lines 13-16. It is therefore evident that the performance requirements presupposed in the Merrill disclosure in no way relate to those of the Fossum reference, and thus there is no basis for suggesting that the "improved performance" of Fossum relied upon by the Office Action would in any way teach or suggest the combination of the Merrill and Fossum references.

Also, a mere suggestion that a monolithic architecture provides "ease of fabrication" does not teach the proposed combination in the face of the teaching away from the proposed combination provided by the very different performance characteristics of Merrill and Fossum described immediately above. The abstract benefits of monolithic architectures are widely known, yet there are many circumstances in which such architectures are entirely inappropriate. There is nothing in the record that teaches that the architecture of Fossum would be appropriate to the very different application presented by Merrill. Accordingly, the Office Action has not carried the burden of presenting a prima facie case of obviousness, and the rejection of claim 1 under 35 U.S.C. § 103(a) over Merrill in view of Fossum should be withdrawn.

Claims 2, 4 and 5 each depend, directly or indirectly, from claim 1 and incorporate

every limitation thereof. Accordingly, projections of claims 2, 4 and 5 under 35 U.S.C. § 103(a) over Merrill and you'll Fossum should be withdrawn for at least the reasons given above in relation to claim 1.

Claim 6 stands rejected under 35 U.S.C. § 103(a) over Merrill in view of Fossum. Claim 6 recites "a CMOS image sensor, formed on said semiconductor substrate... [and] digital memory, also formed on said semiconductor substrate." As discussed above in relation to claim 1, the Office Action has not properly presented grounds for combining the Merrill and Fossum references to show obviousness under 35 U.S.C. § 103(a). The Office Action acknowledges that Merrill alone does not teach or suggest "a CMOS image sensor, formed on said semiconductor substrate... [and] digital memory, also formed on said semiconductor substrate." For at least this reason, therefore, the rejection of claim 6 under 35 U.S.C. § 103(a) over Merrill in view of Fossum should be withdrawn.

Claim 7 depends directly from claim 6 and incorporate every limitation thereof. A courtly, the rejection of claim 7 under 35 U.S.C. § 103(a) over Merrill in view of Fossum should be withdrawn for at least the reasons given above in relation to claim 6.

35 U.S.C. § 103(a)Merrill in view of Fossum et al. and Mandl

Claim 3 stands rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Merrill in view of Fossum and further in view of Mandl (U.S. Patent No. 5,248,971) (hereinafter "Mandl"). The Office Action suggests that Mandl teaches an additional feature of "a video camera that uses an oversampling A/D converter." Accepting *arguendo* that Mandl teaches an oversampling A/D converter, the rejection of claims 3 still lacks proper basis because, as demonstrated above in relation to claim 1, the proposed combination of Merrill and Fossum is not properly supported by a teaching or suggestion to combine references. At least by virtue of the aforementioned difference, Applicant's claimed invention distinguishes over Merrill, Fossum and Mandl. Reconsideration and withdrawal of the rejection under § 103(a) are respectfully requested.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of claims 1-8 and to pass this application to issue.

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Respectfully submitted,

By 

Thomas J. D'Amico

Registration No.: 28,371

Michael Bergman

Registration No.: 42,318

DICKSTEIN SHAPIRO MORIN &

OSHINSKY LLP

2101 L Street NW

Washington, DC 20037-1526

(202) 785-9700

Attorneys for Applicant